Impact of Food Safety Incident on Consumers' Willingness to Pay: the Case of China

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Abstract

After the food safety incident of Bright Dairy's baby cheese which occurred in September 2012, we surveyed the consumers' willingness to pay (WTP) for safer baby cheese in Shanghai, China and received 318 valid questionnaires. This study uses ordered logistic regression model to analyze the impact of the food safety incident on consumers' WTP. The results show that the food safety incident negatively impacts consumers' WTP. More than one third of the respondents chose foreign products as substitutes after the food safety incident and has a higher WTP. In addition, the consumers have a higher WTP who either have the relevant knowledge about food safety or trust Bright Dairy's baby cheese to be safe. However, both the consumers over 40 and working either in the government or in the private sector show negative WTP.

Introduction

With the improvement of living standards, dairy products are playing an increasing important role in people's life. Dairy products have almost become a necessity of people's lives in the developed cities and consumption is rising year by year. However, there have been several serious dairy safety incidents in China in recent years. In 2004, the "Fuyang inferior powdered milk incident" happened in Fuyang city in China. And in July 2008, several infants were diagnosed with kidney stones after consuming powdered milk produced by Sanlu Dairy & Food Co., Ltd. Melamine pollution has been detected in Sanlu Dairy's powdered milk. If it's not one thing, it's another. Bright Dairy & Food Co., Ltd, a joint-stock company headquartered in Shanghai and one of the biggest dairy manufacturers and sellers in China, was involved in six food quality and safety incidents in only five months from June to October 2012. It exposed the food safety management problems of the dairy industry in China again.

According to the statistics of the Customs, the imported dairy products continue to increase, from 0.35 million tons in 2008 to 1.15 million in 2012, more than triple the amount. The amount of imported dairy products passing through Shanghai Customs has been 506,000 tons during the first 11 months in 2013 — up 43.6 percent from a year-ago. On one hand, more and more people can pay higher prices for imported dairy products which reflect the growth of residents' income in China. On the other hand, the occurrence of dairy product safety incidents also drives an increasing number of families to choose the imported dairy product. Some consumers no longer trust the safety of domestic dairy products, and that is not conductive to the development of dairy industry in China.

As people's standard of living rises, so does their demand for quality and safe food. However, the higher quality and safer food lead to higher cost. The extra cost will eventually be passed on to consumers in the form of higher prices. The premium is the consumers' willingness to pay (WTP) and that is determined by many factors.

There have been a number of empirical studies which focus on the WTP for several types of food with special labels such as low pesticide residue, certified food (including organic food, green food, contaminant-free agricultural products, HACCP certification, etc.) and the traceable food. Most existing literature studies firstly consumers' awareness and attitude on certified food and traceable food, then they get consumers' WTP by the contingent valuation method (bidding games, open-ended, payment card and dichotomous choice), in the end, they analyze the factors determining consumers' WTP with Logistic model or Probit model (Alias 2010, Angulo 2007, Dai 2006, Han 2008, Wang 2003, Wang 2009, Zhou 2006).

Some other literature used the laboratory auction method to get the more reliable WTP (Colson 2011 and Colson 2010), but it is complicated and costly.

Regarding other models, Luo (2010) used double-hurdle model to estimate the factors affecting consumers' WTP and the premium and analyzed the differences between the two. Wu (2010) applied CVM to survey the consumers in 13 cities of Jiangsu province, and got the determinants of the consumers' payment level to traceable vegetables with the interval censored model.

Wang (2007) found that information, knowledge, occupation, family income of the shoppers had important effects on the consumer WTP for HACCP dairy products in Beijing using the stepwise regression method. Wang (2012) concluded that the factors influencing the consumers WTP in Beijing, Tianjin and Shi Jiazhuang city for safer liquid milk were knowledge, children and the health of the consumers. Based on the data surveyed in Beijing, Chen (2009) analyzed the impact of "San Lu powdered milk contamination incident" on WTP for certified vegetables, and the result showed the influence was negative.

As reviewed above, compared to studies of fresh vegetables and meat, there are relatively few empirical studies of dairy products, and even fewer that are specific to the baby cheese and studying the impact of the food safety incidents (as a kind of information) on WTP.

This article focuses on how the food safety incident impacts consumers' WTP and choice of dairy products (imported products versus domestic products).

In the sections that follow, the second part is the data sources and a sample characteristic, the third part is an analysis of the factors impacting consumers' WTP. The last part is conclusions and recommendations.

Data

Data sources

The data was collected by a survey in Shanghai, China from January to February, 2013. The main consumers of the baby cheese are 0 to 6 year-old children, so it is their parents who decide which to buy. The parents of three kindergartens located in Pudong and Songjiang district of Shanghai were randomly selected to survey. 400 questionnaires were issued and 308 were valid. Following are the reasons why we chose Shanghai as the research area and the baby cheese as research object. First of all, Shanghai is the center of China's economy and finance and the residents in Shanghai have the highest average income in China. Compared to the general dairy products, the price of cheese is higher. The residents in Shanghai are more able to purchase the baby cheese than anywhere else in China. Secondly, the dairy products of Bright Dairy occupy a large market share in Shanghai, so consumers spend more on them and are more familiar with that brand. Thirdly, on September 18, 2012, Bright Dairy's baby cheese was found contaminated by forbidden mineral salts. Just ten days prior, on September 8, 2012, Bright Dairy received the complaints from 952 consumers for the rancid taste of its bottled milk. There were six food quality and safety incidents in only five months from June to October 2012 in Bright Dairy products.

Sample characteristics

This questionnaire was mainly divided into three parts, including consumers' view on food safety, the consumption of dairy products and baby cheese of Bright Dairy, and demographic characteristics. The respondents' demographic characteristics are shown in table 1.

As we can see from Table 1, the majority of the respondents is female, under 40 years old, has attended college and is working for the government or in the private sector. The monthly income (RMB) in almost half of the households is from 5,000 yuan to 10,000 yuan (1$=6.17yuan, August 6, 2014).

In addition, nearly half of the respondents often buy the dairy products of Bright Dairy and more than 70% have bought baby cheese. Most of the respondents buy the dairy products and baby cheese at the supermarket, and less than 2% buy them at the speciality stores. The survey results also show that almost all respondents are concerned about food safety; half of the respondents think that the food they have recently purchased is safe; after the food safety incidents, 35% of the respondents chose the foreign products as substitutes. We know that consumers have high concern about food safety, but they still don't carefully evaluate the food they purchase. Due to the food safety incidents, some consumers lose confidence in domestic products, and prefer the imported products.

Method

Contingent valuation method (CVM) is adopted to reveal consumers' preferences, through an empirical model to explore consumers' WTP for safer baby cheese. Y represents the consumers' choice. If consumers prefer to consume safer baby cheese, Y = 1;

Table 1. Respondents' Demographic Characteristics

Characteristics	Options	Frequency	Percentage(%)
Gender	Male	102	32.08
	Female	216	67.92
Age	≤29 years	43	13.52
	≥30 years ≤39 years	236	74.21
	≥40 years ≤49 years	22	6.92
	≥50 years ≤59 years	7	2.20
	≥60 years	10	3.14
Education level	Under middle school	8	2.52
	High school	56	17.61
	College	229	72.01
	Graduate	25	7.86
Occupation	Working in government	98	30.82
	Working in private sector	169	53.14
	Freelancers	19	5.97
	Unemployment	14	4.40
	Others	18	5.66
Household monthly income (RMB)	≤5000yuan	51	16.04
	>5000yuan ≤10000yuan	155	48.74
	>10000yuan ≤20000yuan	76	23.90
	>20000yuan	36	11.32

Conversely, Y = 0. The BID represents the additional price that consumers are willing to pay for safer baby cheese. P represents the price of regular baby cheese. X represents factors other than price affecting consumer choice. This would include gender, income, consumers' awareness and evaluation of food safety etc. The symbol ε is a random error term, and α, β, and λ are parameters to be estimated. The utility of safer baby cheese and regular baby cheese are $U_{Y=1}$ (X, BID, ε_1) and $U_{Y=0}$ (X, P, ε_0), respectively. If and only if $U_{Y=1} \geq U_{Y=0}$, the consumers will choose to consume safer baby cheese. Let $U^* = U_{Y=1} - U_{Y=0}$, we can get the probability equation that consumers choose to consume safer baby cheese (Y = 1):

$$P(Y=1) = P(U^* \geq 0) = P(U_{Y=1} \geq U_{Y=0}) \quad (1)$$

Due to ε_1 and ε_0 obeying the Weibull distribution, the equation can be set to linear logistic model through the transformation.

$$\ln\left[\frac{P(Y_1)}{P(Y_0)}\right] = \alpha + \beta X + \lambda BID \quad (2)$$

The price of regular baby cheese was 11yuan/92g at the supermarket in January 2013. We want to know how much the respondents are willing to pay for safer baby cheese. Six price options on safer baby cheese were given to the respondents to choose: no purchase or 11yuan/92g, 11-12yuan/92g, 12-13yuan/92g, 13-14yuan/92g, 14-15yuan/92g and 15-16yuan/92g. The variable definition and summary statistics are showed in Table 2.

Results

Survey results show that only 15.1% of the respondents are willing to pay more for safer baby cheese. The price of the regular baby cheese is 11 yuan/92g, and the respondents are willing to pay 22.9% more of that for safer cheese.We define the WTP as 0, 1, 2, 3, 4, 5 for 0, 0-1, 1-2, 2-3, 3-4, 4-5 which is ordered explained variable and reflects the increasing trend of consumers' WTP. Table 3 shows the results of the ordered logistic model by Stata11.0.

The WTP of the consumers who are aware of the Bright cheese incident (Kno2) is lower, which means that the impact of the food safety incident on WTP is negative. After the food safety incidents, some consumers lost confidence in the products and no longer believe them to be safe, so they don't want to buy the products or pay additional price for them. Knowledge

Table 2. Variable Definition and Summary Statistics

Variable	Variable Definition	Mean	Std.
WTP	Consumers' willingness to pay more for safer cheese (0, 0-1, 1-2, 2-3, 3-4, 4-5 (Unit: yuan/92g))	0.38	1.07
Kno1	Food safety certificates (known = 1, unknown = 0)	0.77	0.42
Kno2	Bright Dairy baby cheese incident (known = 1, unknown = 0)	0.14	0.34
Kno3	Mineral salt (known = 1, unknown = 0)	0.48	0.50
Kno4	Knowledge of agriculture, food or medical (known = 1, unknown = 0)	0.14	0.34
PD&SL	Production date and shelf life (as the most primary factor = 1, others = 0)	0.48	0.50
BA	Brand awareness (as the most primary factor = 1, others = 0)	0.31	0.46
Freq	Purchasing frequency of baby cheese (one time or more a week = 1, other = 0)	0.26	0.44
Atti	Attitude for "banning mineral salt in infant food " (agree = 2, agree a little = 1, disagree = 0)	1.17	0.68
SE	Evaluation for Bright Dairy baby cheese (safe = 1, others = 0)	0.30	0.46
Subs	Substitutes for domestic baby cheese (foreign = 1, others = 0)	0.35	0.48
Gender	Male = 1, female = 0	0.32	0.47
Age	Over 40 years old = 1, others = 0	0.12	0.33
Edu	College or above = 1, others = 0	0.80	0.40
Work	Working for the government or in the private sector = 1, others = 0	0.84	0.37
Income	>10000yuan = 1, others = 0	0.35	0.48

Table 3. The Regression Results of Ordered Logistic Model (N = 318)

Variable	Coefficient	Standard Error	P>|z|
Kno1	0.486	0.475	0.307
Kno2	-0.957*	0.565	0.091
Kno3	1.045***	0.370	0.005
Kno4	1.097***	0.420	0.009
PD&SL	0.883*	0.497	0.076
BA	0.477	0.561	0.396
Freq	0.326	0.362	0.367
Atti	0.189	0.283	0.504
SE	1.047***	0.358	0.003
Subs	0.707**	0.355	0.046
Gender	0.538	0.372	0.148
Age	-2.259***	0.866	0.009
Edu	0.216	0.532	0.684
Work	-0.904*	0.491	0.066
Income	0.320	0.357	0.371
Log		-185.33	
Wald χ^2		43.14	
Pseudo R^2		0.1043	

Note: *, **, *** denote 10%, 5%, and 1% significance, respectively.

of mineral salt (Kno3) and Knowledge of agriculture or food or medical (Kno4) have significant positive impacts on their willingness to pay for safer baby cheese. The consumers who know about the mineral salts are willing to pay more for safer baby cheese to avoid risks. Besides, the consumers who have knowledge about agriculture, food or medicine have a higher WTP for safer baby cheese because of their higher knowledge of safe food.

Consumers who consider the production date and shelf life to be important have a higher WTP. Although the effect of "BA" is not significant, the coef-

ficient is positive. It means that consumers who care about the brand are willing to pay more. "SE" positively affects the consumers' WTP. In other words, the safer consumers believe the Bright Dairy baby cheese to be, the higher their WTP for safer baby cheese. High safety evaluation means high trust so that consumers are willing to buy the products and pay more.

"Subs" indicates that after the food safety incident, consumers who chose a foreign brand of baby cheese as a substitute have higher WTP than others. These consumers think the imported food is safer and their income is higher so that they are able to buy the foreign products. Therefore, these consumers are willing to pay more for even Chinese food as long as the safety is ensured.

In addition, the impact of age (Age) and work (Work) on WTP is significant. WTP of consumers over 40 of age (or "over 40"...) is lower than that of the consumers under 40 (or just "under 40"). Table 1 shows that about 12% of respondents are over the age of 40. Those people may be the children's grandparents. Their WTP for food safety is lower because of their consciousness and consumption habits. Besides, the age of the children of consumers over 40 may be older so their demand for baby cheese is lower. Table 1 also shows that the consumers besides those who work for the government or in the private sector are "freelance", "unemployment" and "other". Some of these consumers may be housewives who usually buy food and have more time to consider food characteristics so they have a higher recognition of safer food, and consequently a higher willingness to pay.

Conclusions and Recommendations

Based on the "mineral salt incident of Bright Dairy baby cheese", we surveyed consumers' WTP in Shanghai for safer baby cheese and analyzed the factors impacting WTP with ordered Logistic model. We came to the following conclusions: Firstly, the food safety incident negatively affects consumers' WTP for safer baby cheese. The WTP of the consumers who know about mineral salts or have knowledge about agriculture, food or medicine have higher WTP for safer baby cheese. Secondly, the WTP of the consumers who consider the production date and shelf life to be important is higher. Thirdly, the consumers who believe the Bright Dairy baby cheese is safe are willing to pay more for safer baby cheese. Fourthly, the consumers choosing foreign brands of cheese as substitutes have a higher WTP than others. Finally, the consumers who are over 40 and work in either the government or in the private sector show negative WTP.

According to the above conclusions, we make the following recommendations: Firstly, after the food safety incidents, the government and relevant supervisory departments should quickly begin the emergency plan to control the situation and remove the defective products from their shelves, recall and seal the products. Also the vendors should tell the consumers the truth and offer remedial measures which will be implemented to eliminate consumers' panic and enhance their confidence. Secondly, the organizations issuing information (especially the media) should disseminate real and reliable information to guide consumers in their search of relevant information to increase their knowledge of food safety, which will result in their heightened awareness. Thirdly, in order to improve consumer confidence in the domestic products and take advantage of brand preference in the consumers' minds, the manufacturers should produce the products in strict accordance with the provisions of the state and eliminate food safety issues. This is the most fundamental way to solve the problem of food safety, but it requires effective supervision of the government and consumers. Finally, the target consumer groups of the safer baby cheese should be the young mothers below the age of 40 and the housewives.

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